

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel**  
**International**  
**Advanced Level**

Centre Number

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Candidate Number

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**Friday 12 June 2020**

Afternoon (Time: 1 hour 30 minutes)

Paper Reference **WST02/01**

**Mathematics**

**International Advanced Subsidiary/Advanced Level**  
**Statistics S2**

**You must have:**

Mathematical Formulae and Statistical Tables (Blue), calculator

Total Marks

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**Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.**

### Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Values from the statistical tables should be quoted in full. If a calculator is used instead of the tables, the value should be given to an equivalent degree of accuracy.
- Inexact answers should be given to three significant figures unless otherwise stated.

### Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 6 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ►

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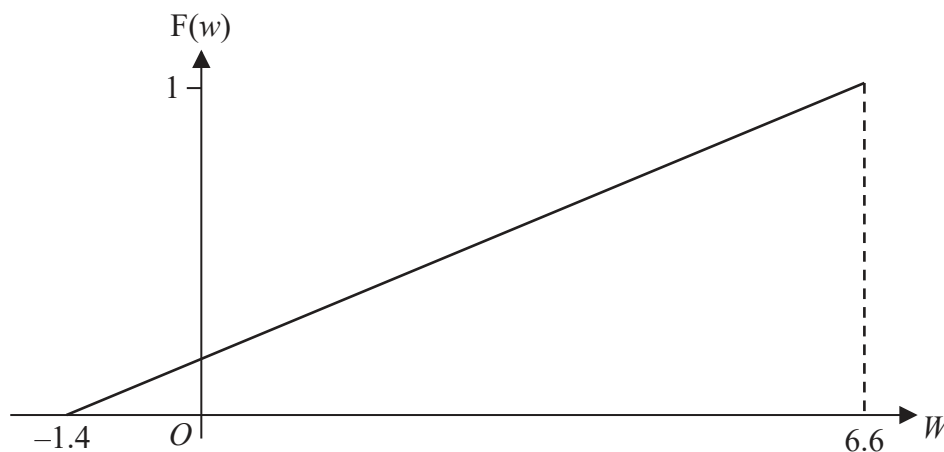




2. In the summer Kylie catches a local steam train to work each day. The published arrival time for the train is 10 am.

The random variable  $W$  is the train's actual arrival time minus the published arrival time, in minutes. When the value of  $W$  is positive, the train is late.

The cumulative distribution function  $F(w)$  is shown in the sketch below.



- (a) Specify fully the probability density function  $f(w)$  of  $W$ . (2)
- (b) Write down the value of  $E(W)$  (1)
- (c) Calculate  $\alpha$  such that  $P(\alpha \leq W \leq 1.6) = 0.35$  (2)

A day is selected at random.

- (d) Calculate the probability that on this day the train arrives between 1.2 minutes late and 2.4 minutes late. (2)

Given that on this day the train was between 1.2 minutes late and 2.4 minutes late,

- (e) calculate the probability that it was more than 2 minutes late. (2)

A random sample of 40 days is taken.

- (f) Calculate the probability that for at least 10 of these days the train is between 1.2 minutes late and 2.4 minutes late. (3)

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4. In a peat bog, Common Spotted-orchids occur at a mean rate of 4.5 per  $m^2$
- (a) Give an assumption, not already stated, that is required for the number of Common Spotted-orchids per  $m^2$  of the peat bog to follow a Poisson distribution. (1)

Given that the number of Common Spotted-orchids in  $1 m^2$  of the peat bog can be modelled by a Poisson distribution,

- (b) find the probability that in a randomly selected  $1 m^2$  of the peat bog
- (i) there are exactly 6 Common Spotted-orchids,
- (ii) there are fewer than 10 but more than 4 Common Spotted-orchids. (4)

Juan believes that by introducing a new management scheme the number of Common Spotted-orchids in the peat bog will increase. After three years under the new management scheme, a randomly selected  $2 m^2$  of the peat bog contains 11 Common Spotted-orchids.

- (c) Using a 5% significance level assess Juan's belief. State your hypotheses clearly. (5)

Assuming that in the peat bog, Common Spotted-orchids still occur at a mean rate of 4.5 per  $m^2$

- (d) use a normal approximation to find the probability that in a randomly selected  $20 m^2$  of the peat bog there are fewer than 70 Common Spotted-orchids. (3)

Following a period of dry weather, the probability that there are fewer than 70 Common Spotted-orchids in a randomly selected  $20 m^2$  of the peat bog is 0.012

A random sample of 200 non-overlapping  $20 m^2$  areas of the peat bog is taken.

- (e) Using a suitable approximation, calculate the probability that at most 1 of these areas contains fewer than 70 Common Spotted-orchids. (3)

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